

Z147w

S/020/61/137/004/014/031

B104/B206

The quantum-mechanical theory of...

$$\psi_E(q, Q) = \sum_{w, \epsilon} \alpha_{w\epsilon}(E) \psi_w(q) \psi_\epsilon(Q), \quad (4)$$

$$\psi_{E^*}(q, Q) = \sum_{w^*, \epsilon^*} \alpha_{w^*\epsilon^*}^*(E^*) \psi_{w^*}^*(q) \psi_{\epsilon^*}^*(Q). \quad (5)$$

are obtained for the upper and lower electron state. The value of $[\alpha_{w\epsilon}(E)]^2$ is defined as a probability that at a certain state of the molecule with the energy of vibration E, the energy of vibration w of group A and the energy value ϵ of the heat accumulator can be determined. This probability has maximum values if $w + \epsilon = E$, or almost equal to E. The same applies to $[\alpha_{w^*\epsilon^*}^*(E)]^2$. The half-widths of these curves as functions of E and E^* are the greater, the greater the interaction between group A and the other degrees of freedom. The probability of optical transitions with the frequency $h\nu = E_{\epsilon_1} + E^* - E$ is proportional to

$$\begin{aligned} |D_{EE^*}|^2 &= \left| \int \psi_1(x) \psi_E(q, Q) D\psi_2^*(x) \psi_{E^*}(q, Q) dx dq dQ \right|^2 = \\ &= |D_{12}|^2 \left[\left\{ \sum_{w, \epsilon} \alpha_{w\epsilon}(E) \psi_w(q) \psi_\epsilon(Q) \right\} \left\{ \sum_{w^*, \epsilon^*} \alpha_{w^*\epsilon^*}^*(E^*) \psi_{w^*}^*(q) \psi_{\epsilon^*}^*(Q) \right\} \right]^2 = \\ &= |D_{12}|^2 \left[\sum_{w, w^*, \epsilon} \alpha_{w\epsilon}(E) \alpha_{w^*\epsilon}^*(E^*) M_{ww^*}^2 \right]^2. \quad (10) \end{aligned}$$

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21490

S/020/61/137/004/014/031
B104/B206

The quantum-mechanical theory of...

This expression describes the outline of the absorption band, if all molecules are in the same initial state with the energy E . With the aid of Eq. (10) the author discusses the complicated character of the spectral bands caused by the strong interaction between the degrees of freedom of group A and the other degrees of freedom. On the basis of comprehensive studies of Eqs. (4), (5) and (10), Levshin's law on the mirror symmetry of the absorption- and emission bands can be explained for solutions. It further follows that the areas of the absorption- and emission bands are only determined by the probability of the electron transitions. The outline of the absorption band is mainly determined by the dependence of $(M_{wv}^*)^2$ on w and w^* . S. I. Kubarev is mentioned. There are 7 references: 6 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut fiziki Akademii nauk BSSR (Institute of Physics AS BSSR)

SUBMITTED: December 9, 1960

Card 4/4

RUBANOV, A.S.; STEPANOV, B.I., akademik

Entropy of the distribution of dynamic variables. Dokl. AN SSSR
140 no.1:96-99 S-O '61. (MIRA 14:9)

1. Institut fiziki AN BSSR. 2. AN BSSR (for Stepanov).
(Information theory)

STEPANOV, B. I. (and coworkers)

"The oscillation of an inorganic plane-parallel layer."

The report dealt with the theory of laser resonators. Results of the solution of transport equations and Maxwell equations for inorganic layers with a negative absorption coefficient in the absence of outside radiation were given. The conditions for a stationary oscillation were obtained; by calculating the nonlinear dependence of the absorption coefficient on the radiation density, the values for density and energy release inside the layer under conditions of stationary oscillation were determined.

The report presented at the 11th Conference on Luminescence (Molecular luminescence and luminescence analysis) Minsk, 10-15 Sept. 1962.

STEPANOV, B. I., SAMSON, A. M., and CHEKALINSKAYA, Yu. I.

"The effect of noises on the oscillation of a bounded plane-parallel layer."

The light field inside and outside the resonator in the presence of noises was discussed.

The report presented at the 11th Conference on Luminescence (Molecular luminescence and luminescence analysis) Minsk, 10-15 Sept. 1962.

STSYAPANAU, B.I.; CHAKALINSKAYA, Yu.I.

Optical properties of alyer system with a negative coefficient of
absorption. Vestsi AN BSSR.Ser.fiz.-tekhn.nav. no.1:42-48 '62.
(MIRA 16:9)

(Absorption of light)

STEPANOV, B. I.

S/201/62/000/002/001/001
1004 /1204

AUTHOR: Stepanov, B.I.

TITLE: Optical properties of quantum generators and amplifiers

PERIODICAL: Akademiya nauk Belorusskoy SSR. Izvestiya, Seriya fiziko-
tekhnicheskikh nauk, no.2, 1962, 17-25

TEXT: The paper reviews the work performed by coworkers at the Institute of Physics of the AS of BSSR in the field of optical quantum generators and amplifiers employing parallel layers with negative absorption coefficient. It is pointed out that a strict theory of the optical properties of such layers should be based on the non-linear dependence between the density of radiation and the absorption coefficient. The values of the radiation density and of the absorption coefficient are determined employing Maxwell's equations. Analytical expressions for the important case of $u_0 = 0$ are given (u_0 denotes the density of radiation which falls on one surface of the layer). For a given thickness of the layer the generated frequency is strictly determined by the generation conditions.

Card 1/2

S/201/62/000/002/001/001
I004/I204

Optical properties...

There are 12 references.

SUBMITTED: January 17, 1962

100

STEPANOV, B.I.

S/201/62/000/004/001/005
D234/D308

AUTHORS: Stsyapanaw, B.I. and Rubanaw, A.S.

TITLE: Distribution entropy of coordinates and momenta of a harmonic oscillator

PERIODICAL: Akademiya navuk Byelaruskay SSR. Vestsi. Seriya fizika-tekhnichnykh navuk, no. 4, 1962, 30-36

TEXT: For the entropies of Vth stationary state of a harmonic quantum oscillator, the authors obtain

$$H_q^V = \frac{1}{2} \ln \frac{h}{\mu \omega} - \int_{-\infty}^{\infty} \frac{e^{-y^2}}{\sqrt{\pi} 2^{V-1} V!} P_V^2(y) \ln \frac{e^{-y^2}}{\sqrt{\pi} 2^{V-1} V!} P_V^2(y) dy; \quad (2)$$

$$H_q^V = \frac{1}{2} \ln \mu \omega h - \int_{-\infty}^{\infty} \frac{e^{-y^2}}{\sqrt{\pi} 2^{V-1} V!} P_V^2(y) \ln \frac{e^{-y^2}}{\sqrt{\pi} 2^{V-1} V!} P_V^2(y) dy, \quad (3)$$

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S/201/62/000/004/001/005
D234/D308

Distribution entropy ...

P_v being Hermite's polynoms. The integrals were computed on an electronic computer 'Minsk-1' and are tabulated up to $v = 12$. Inequalities are established by which the difference of H and its value for $v = 0$ does not exceed $(\frac{1}{2}) \ln(2v + 1)$. The entropies are found to increase monotonically. The dependence on temperature is found to be

$$H_q = H_q^{v=0} + \frac{1}{2} \ln \operatorname{cth} \frac{h\omega}{2kT}; \quad (12)$$

$$H_p = H_p^{v=0} + \frac{1}{2} \ln \operatorname{cth} \frac{h\omega}{2kT}. \quad (13)$$

If light is absorbed from outside one must substitute the equilibrium temperature by

$$T(u + S) = \frac{h\omega}{k \ln \left[1 + \frac{A}{B(u + S)} \right]}. \quad (20)$$

A, B being the probability coefficients for transitions between levels, u the density of equilibrium radiation. The relation

$$H_E < H_q + H_p \quad (25)$$

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Distribution entropy ...

S/201/62/000/004/001/005
D234/D308

is established. It is found that for a given average value H_p and H_q reach their maximum value at thermodynamical equilibrium. ^p There are 2 tables.

Card 3/3

STEPANOV, B.I.; KRAVTSOV, L.A.; RUBINOV. A.N.

Sensitivity of the universal relationship between absorption and luminescence spectra of complex molecules to the presence of admixtures. Dokl. AN Bssr 6 no.1;14-18 Ja '62. (MIRA 15:2)

1. Institut fiziki AN BSSR.
(Molecular spectra)

IVANOV, A.P.; STEPANOV, B.I.; BERKOVSKIY, B.M.; KATSEV, I.L.

Calculating the effect of inhomogeneities on the light regime of
a parallel-plate layer in nonlinear approximation. Dokl. AN BSSR
6 no.3:147-150 Mr '62. (MIRA 15:3)

1. Institut fiziki AN BSSR.

(Optics, Physical)

24,3700

S/250/62/006/005/002/007
1024/1224

AUTHORS: E. P. Zege, A. M. Samson, and B. I. Stepanov

TITLE: Flare up of proper glow of a plane-parallel layer

PERIODICAL: Akademiya nauk Belaruskay, SSR. Doklady, v. 6, no. 5, 1962, 288-292

TEXT: In contrast to previous works the calculations of the present paper are based on the approximation of non-linear optics. The time-dependence of the radiation density, absorption coefficient and brightness of outgoing fluxes is investigated. By differentiating the expression, given in: Stepanov B. I. DAN BSSR, 5, 41, 1961, for the time-dependence of the radiation density inside a plane-parallel layer, in conditions of multiple reflections, a differential equation is obtained which is equivalent to the differential form of Bugar's law. This equation is valid only for times much longer than those needed for light to traverse the thickness of the layer. A relation between the absorption coefficient (assumed throughout this work not to depend explicitly on time) and the radiation density in steady-state conditions is introduced in this equation which is then integrated, yielding an expression relating the initial and steady-state values of the radiation density, the time and a non-linearity factor. This expression is studied in various cases corresponding to stable generation or to attenuation with time. (A necessary condition is that $u^0 \neq 0$). Curves are plotted describing the time behavior of $u/u_{\text{steady-state}}$ for 4 values of $u^0/u_{\text{steady-state}}$ (u is the radiation density and the superscript⁰ denotes initial value). An expression is given for the time necessary to reach steady-state conditions

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Flare up of proper glow of a...

S/250/62/006/005/002/007

1024/1224

The minimum value, corresponding to very large $u_{\text{steady-state}}$, is calculated for: reflection coefficient = 0.99, thickness of layer = 10 cm and light velocity = $3 \cdot 10^{-8}$ cm/sec and is found to be $2.3 \cdot 10^{-10}$ sec. Next, the basic equation is improved by including in addition to forced emission also spontaneous emission and other internal energy sources. It is then integrated and the solution investigated in various cases. In contrast to the previous case self-excitation occurs also for $u^0 = 0$ while the transition time to steady-state conditions is of the same order of magnitude as before. There is one figure.

ASSOCIATION: Institut fiziki AN BSSR (Institute of Physics AS BSSR)

SUBMITTED: February 22, 1962

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247007

S/250/62/006/006/002/006
I046/I242

AUTHOR: Stepanov, P.I.

TITLE: The photic field within an unbound plane-parallel layer under generative conditions

PERIODICAL: Akademiya nauk Belorusskoy SSR. Doklady, v.6, no.6, 1962, 355-359

TEXT: In layers of negative absorption coefficients, photic fields may exist even when there is no incident external energy flux; such layers may thus be used in generating radiation. Geometrical optics is applied to show that unbound plane-parallel layers of negative absorption coefficients generate radiation in all possible directions to the surface. Narrow beams of energy can be generated only in bound plane-parallel layers whose thickness is considerably larger than their base dimensions. There is 1 figure. ✓B

ASSOCIATION: Institut fiziki AN BSSR (Institute of Physics, AS BSSR)

SUBMITTED: March 27, 1962

Card 1/1

STEPANOV, B.I.; IVANOV, A.P.; BERKOVSKIY, B.M.; KATSEV, I.L.

Radiation transfer inside a plane-parallel layer in the approximation of nonlinear optics. Opt. i spektr. 7 no.4:533-536
Ap '62. (MIRA 15:5)

(Radiation) (Light--Transmission)

33649

S/051/62/012/001/018/020

E032/E514

24.3500 (1137, 1138, 1144)

AUTHORS: Stepanov, B.I. and Kazachenko, L.P.

TITLE: Application of the method of moments to the
description of spectral bands of complex systems

PERIODICAL: Optika i spektroskopiya, v.12, no.1, 1962, 131-133

TEXT: It is pointed out that the most rational way of
analysing experimental distribution curves $\rho(\nu)$, which describe
the spectral band profiles, is to use the method of moments.
The method of moments has been discussed by M. Lax (Ref.7: J.Chem.
Phys., 20, 1752, 1952), K. K. Rebane and his collaborators
(Ref.8: Opt.spektr., 9, 557, 1960) and S. I. Kubarev (Ref.9: DAN
SSSR, 130, 1067, 1960; Izv.AN SSSR, ser.fiz., 24,775,1960; Opt.i
spektr., 9, 3, 1960). The present authors give a brief summary
of the published accounts of this method and apply it to an
example borrowed from the paper by N. A. Borisevich (Ref.11: Izv.
AN BSSR No.3, 44, 1961) which is concerned with the luminescence
of 3-aminophthalamide vapour. It is shown that by calculating
the moments for the bands one can very simply describe the

X

Card 1/2

S/051/62/012/002/007/020
E202/E192

243500

AUTHORS: Stepanov, B.I., and Samson, A.M.

TITLE: On the theory of absorption and luminescence of complex molecules.
I. The effect of the intramolecular and intermolecular distribution of vibrational energy on the optical properties of molecules

PERIODICAL: Optika i spektroskopiya, v.12, no.2, 1962, 224-232

TEXT: Applying a method of probability to particles with two electron levels, a general theory is developed accounting for the effects of vibrational energy distribution on the optical properties of the complex molecules. Low pressure vapours and solutions are chosen as particular cases. The method accounts automatically for all the equations of kinetic equilibria, which permits determination of the quantum yield of luminescence. It is thus an improvement on the earlier method suggested by B.I. Stepanov (Ref.1: Lyuminestsentsiya slozhnykh molekul (The Luminescence of Complex Molecules), Izd. AN BSSR, Minsk, 1956).

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On the theory of absorption and ... S/051/62/012/002/007/020
E202/E192

It is concluded that the anti-Stokes fall in fluorescence has not yet been fully explained, but the analysis of the formulae led the authors to believe that within the scope of the probability method there could be only two possible causes: a) the fall may be due to the presence of non-active absorption, as explained in the previous paper; or b) by assuming that during the excitation of luminescence in the anti-Stokes region its distribution within the molecules is incomplete, resulting in the appearance of the individual degrees of freedom of molecules. The case of solutions or vapours at high pressures is also discussed and the formulae developed are suitable for complex, semi-complex or simple molecules.

There is 1 figure.

SUBMITTED: January 27, 1961

Card 2/2

S/051/62/012/003/015/016
EO32/E314

AUTHOR: Stepanov, B.I.

TITLE: Reflection and transmission of light by plane-parallel layers with a negative absorption coefficient

PERIODICAL: Optika i spektroskopiya, v. 12, no. 3, 1962,
440 - 445

TEXT: It is pointed out that although a rigorous solution can only be obtained within the framework of wave and non-linear optics, it is possible to use the geometrical-optics approximation to obtain some important results. In the present note the author computes the transmitted and reflected intensity of a plane-parallel layer for various values of the negative absorption coefficient. Both normal and oblique incidence is treated. Figs. 2 and 3 illustrate the results obtained. Fig. 2 shows the transmission (R) and reflection (T) coefficients of a plane-parallel layer as a function of $k\ell$, where k is the absorption coefficient and ℓ the thickness of the layer. The figures marked on the curves represent the reflection coefficient of the boundary(r). Fig. 3 shows R and T as

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Reflection and transmission S/051/62/012/003/015/016
EO32/E314

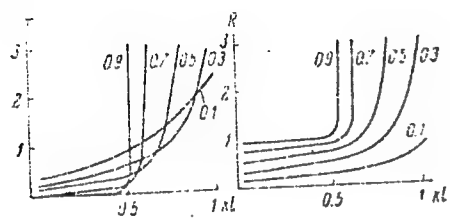
functions of r . The figures marked on the curves represent the values of $e^{-k\ell}$. These figures refer to normal incidence. In the case of oblique incidence, when $r^2 e^{-2k\ell} = 1$, an intense light flux leaves the plane-parallel plate at right-angles to it and is surrounded by a cone of much weaker intensity. This result is said to be in agreement with experimental evidence described by A.L. Schawlow (Ref. 10 - Scient. Amer., 204, 52, 1961). It is stated that interference and nonlinear phenomena will be discussed in a future publication. There are 3 figures. J

SUBMITTED: August 4, 1961

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Reflection and transmission

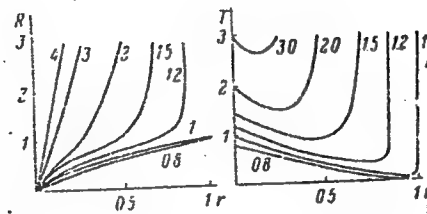
Fig. 2:



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S/051/62/012/003/015/016
E032/E314

Fig. 3:



STEPANOV, B.I.; JBANKOV, R.G. [Zibankov, R.G.]; MARUPOV, R.

Structure of cellulose hydrate. Analele chimie 17 no.2:
34-41 Ap-Je '62.

24.3950

37227
S/051/62/012/004/015/015
E039/E485

AUTHORS: Stepanov, B.I., Ivanov, A.P., Berkovskiy, B.M.,
Katsev, I.L.

TITLE: The transfer of radiation in a plane parallel layer
in the approximation of nonlinear optics

PERIODICAL: Optika i spektroskopiya, v.12, no.4, 1962, 533-536

TEXT: The problem of the transfer of radiation in a plane parallel layer is considered on the basis of equations for the transmission of radiant energy with a nonlinear dependence of the absorption coefficient for dense radiation. The calculations are for monochromatic radiation (flux S_0) propagated normal to the surface of a layer of thickness l . On account of multiple reflections between the boundary layers there will be two fluxes S_1 and S_2 in opposite directions at any point x in the layer. An expression for the absorption coefficient k is derived

$$k = \frac{k_0}{1 + \alpha(S_1 + S_2)} \quad (2)$$

where k_0 is the absorption coefficient in the absence of a
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S/051/62/012/004/015/015
E039/E485

The transfer of radiation ...

light field and α the nonlinear parameter ($\alpha \geq 0$). The problem is only considered for a particular case which allows an easy analytical solution, namely by putting S_0 equal to zero. Equations are derived for the change in value of the absorption coefficient with position in the layer and its dependence on the reflectivity of the surface. The effect of a supplementary field of density u^* due to the thermal background is also considered and equations derived for the absorption coefficient k and the intensity of radiation $S_{\text{исп}}$ escaping from the layer.

$$k = \frac{k_0}{1 + avu^* + \alpha(S_1 + S_2)} \quad (16)$$

and

$$S_{\text{исп}} = \frac{(1 + avu^*) \ln r - k_0 l}{2\alpha} \quad (17)$$

where r is the coefficient of reflection and v is the velocity of light. It follows that the condition for radiation from the layer is

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The transfer of radiation ...

S/051/62/012/004/015/015
E039/E485

$$re^{-\frac{k_0 l}{1 + avu^x}} > 1 \quad (18)$$

and that the presence of a supplementary field u^x displaces the self excitation limit in the region of greater $|k_0 l|$ or r .

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SUBMITTED: December 30, 1961

Card 3/3

S/048/62/026/001/003/018
B125/B104

AUTHOR: Stepanov, B. I.

TITLE: The present state of luminescence theory for complex molecules

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 1, 1962, 32 - 42

TEXT: One of the two sets of problems in luminescence theory of complex molecules is concerned with the establishment of a relationship between structure and optical properties of molecules. Definite conclusions cannot be drawn as yet since theory is not enough elaborate. The other set of problems concerns the clarification of those properties that are characteristic of all molecules. The present article which gives a survey on the years from 1952 up to now refers to the following Soviet papers: Samson A. M. (Dissertatsiya. BGU, Minsk, 1960), Biberman L. M., Beklenko B. A. (Zh. eksperim. i teor. fiz., 39, 88 (1960)), Rebane, K. K. (Optika i spektroskopiya, 2, 557 (1960)), Kubarev, S. I. (Dokl. AN SSSR, 130, 1067 (1960); Izv. AN SSSR. Ser. fiz., 24, 529 (1960); Optika i
Card 1/2

7.2576 (1035, 1163, 1532)
24.3500 (1144)

35538

S/020/62/142/006/010/019
B104/B108

AUTHORS: Stepanov, B. I., Academician AS BSSR, and Samson, A. M.

TITLE: Calculation of the generation power of a plane-parallel layer

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 6, 1962, 1282-1284

TEXT: The generation power of a plane-parallel layer is studied in approximation of non-linear optics taking into account the dependence of the absorption coefficient k on the radiation density u . Under generation conditions k and u are given by

$$k = \frac{\ln r}{l}; \quad (4)$$

$$u = \frac{k_0 - k}{\alpha k} = \frac{k_0 l - \ln r}{\alpha \ln r}. \quad (5),$$

where r is the reflection coefficient at the boundary of the layer; α and k_0 are parameters characterizing the substance of the layer, α always being positive, while k_0 may be positive or negative. The absorption coefficient is negative and completely determined by the resonator properties of the Card 1/2

SUBMITTED: October 4, 1961

Card 2/2

STEPANOV, B.I., akademik; SAMSON, A.M.

Effect of noise on the spectral composition and angular distribution
of the emission from a bounded plane-parallel layer. Dokl. AN SSSR
145 no.3:560-563 J1 '62. (MIRA 15:7)

1. Institut fiziki AN BSSR. 2. Akademiya nauk BSSR (for Stepanov).
(Optics, Geometrical) (Radiation)

KHAPALYUK, A.P.; STEPANOV, B.I.; SOTSKIY, B.A.

Electromagnetic field in a plane-parallel layer under self-excitation. Opt.i spektr. 13 no.2:282-285 Ag '62. (MIRA 15:11)

(Optics, Physical)

STEPANOV, B.I., akademik, red.; BEL'ZATSKAYA, L., red.izd-va;
ATLAS, A., tekhn. red.

[Spectroscopy of light-diffusing media] Spektroskopiia
svetorasseivaiushchikh sred. Minsk, Izd-vo AN BSSR, 1963.
211 p. (MIRA 17:2)

1. Akademiya navuk BSSR, Minsk. Instytut fiziki. 2. Akademiya
nauk Belorusskoy SSR (for Stepanov).

FRISHIVALKO, Anatoliy Petrovich; STEPANOV, B.I., akademik, red.;
TKACHEVA, T., red. izd-va; VOLCKHANOVICH, I., tekhn.
red.

[Reflection of light from absorbing media] Otrazhenie
sveta ot pogloshchaiushchikh sred. Minsk, Izd-vo AN Bel.
SSR, 1963. 429 p. (MIRA 16:11)

1. Akademiya nauk Belorusskoy SSR (for Stepanov).
(Reflection (Optics)) (Absorption of light)

STEPANOV, Boris Ivanovich; GRIEKOVSKIY, Viktor Pavlovich

[Introduction to the theory of luminescence] Vvedenie
v teoriyu luminestsentsii. Minsk, Izd-vo AN BSSR, 1963.
442 p. (MIRA 16:10)

(Luminescence)

STEPANOV, B.I.; GRIBOVSKIY, V.P.

Effect of the degeneration of energy levels and radiation losses on
the optical characteristics of a three-level laser. Dokl. AN BSSR 7
no.1:17-21 Ja '63. (MIRA 17:1)

1. Institut fiziki AN BSSR.

STEPANOV, B.I.; GRIBKOVSKIY, V.P.

Allowing for the splitting of the metastable level in a three-level laser. Dokl. AN BSSR 7 no.5:305-308 My '63. (MIRA 16:12)

1. Institut fiziki AN BSSR.

STEPANOV, B.I.; ANDREYEVA, M.A.

Interaction of 2-chlorobenzene-(1-azo-1')-2'-naphthol
with fluorene. Zhur. VKHO 8 no.5:577 '63. (MIRA 17:1)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni
Mendeleyeva.

ACCESSION NR: AP3005620

S/0046/63/009/003/0291/0295

AUTHORS: Veller, V. A.; Stepanov, B. I.

TITLE: Ultrasonic sirens driven by electric motors

SOURCE: Akusticheskii zhurnal, v. 9, no. 3, 1963, 291-295

TOPIC TAGS: ultrasonic siren, de Laval nozzle, injection chamber, exhaust chamber, acoustic power, diesel locomotive, stator orifice, sonic siren

ABSTRACT: The construction characteristics of several sonic and ultrasonic sirens operating with gas jets in a wide frequency range (built at the All-Union Scientific Research Institute of Diesel Locomotives) have been presented. The construction details include axial type sirens, right angle orifices in the stator and rotor with de Laval type nozzles, stators loosely mounted on the generator body in the axial direction, and air compression in the siren from 4 to 5 kg-force/cm². A two-chamber siren is described, one chamber serving as the injection chamber and the second as the exhaust chamber. The stator has two orifice systems, one connected to the exhaust chamber and the other to the compression chamber (see Fig. 1 on the Enclosure). These characteristics enable the sirens to operate in sonic as well as ultrasonic frequency ranges with 0.8, 8 and as much as 20 kw acoustic power. At

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ACCESSION NR: AP3005620

8 kw, the air pressure is 3.5 atm at an efficiency of 39%. Orig. art. has: 6 figures, 1 formula, and 1 table.

ASSOCIATION: Vsesoyuznyy n.-i. teplovoznyy institut, Kolonna (All-Union Scientific Research Institute of Diesel Locomotives)

SUBMITTED: 16Jan63

DATE ACQ: 27Aug63

ENCL: 01

SUB CODE: IE

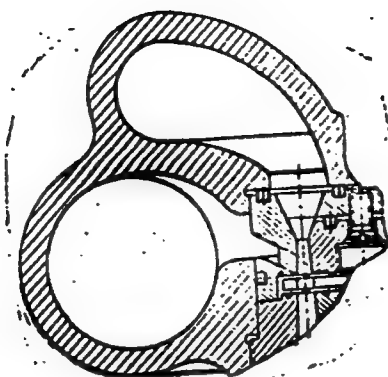
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ACCESSION NR: AP3005620

ENCLOSURE: 01



Card 3/3

STEPANOV, B.I.

AID Nr. 986-8 10 June

DEPENDENCE OF ABSORPTION FACTOR ON INTENSITY AND ANGULAR DISTRIBUTION OF INCIDENT RADIATION (USSR)

Gribkovskiy, V. P., and B. I. Stepanov. Optika i spektroskopiya, v. 14, no. 4, Apr 1963, 484-490. S/051/63/014/004/006/026

Consideration is given to anisotropy of the absorption factor (Kravets integral) which arises in the irradiation of matter (particles with an arbitrary number of energy levels) by radiation of varying polarization, intensity, and angular distribution. The last two parameters are related to absorption power and the absorption factor under conditions of incident radiation. The formula derived is valid, under any irradiation conditions, for media with positive or negative absorption factors. Calculations of absorption factors are given for isotropic radiation, linearly polarized radiation, a strong beam propagated at right angles to a weak beam, and other conditions; in the case of two beams of arbitrary density intersecting at an arbitrary angle, the calculation was made on the electronic computer "Minsk." The results apply to problems of nonlinear optics and laser processes. [BB]

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STEPANOV, B.I.
AID Nr. 997-4 25 June

INFLUENCE OF NOISE ON GENERATION OF A BOUNDED PLANE-
PARALLEL LAYER (USSR)

Stepanov, B. I., A. M. Samson, and Yu. I. Chekalinskaya. IN: Akademiya
nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 27, no. 4, Apr 1963, 488-491.
S/048/63/027/004/006/026

The effect of noise on the spectral width and angular distribution of radiation generated by a bounded plane-parallel layer has been studied. The noise arises as a result of amplification of external radiation, including spontaneous emission. It is shown that spectral broadening resulting from noise is negligibly small, and that angular distribution changes due to noise depend on the parameters of the layer. In the specific case of a cylinder with plane-parallel ends and nonreflecting side walls, the broadening of the output beam angle because of noise is negligibly small. [BB]

Card 1/1

STEPANOV, B.I.; ZHBANKOV, R.G.

Use of infrared spectroscopy for studying cellulose. Zav.
lab. 29 no.6:696-699 '63. (MIRA 16:6)

(Cellulose—Absorption spectra)

ANAN'YEV, Yu.A.; GRIBKOVSKIY, V.P.; MAK, A.A.; STEPANOV, B.I., akademik

Properties of a four-level optical quantum generator.
Dokl. AN SSSR 150 no.3:507-510 My '63. (MIRA 16:6)

1. Institut fiziki AN Belorusskoy SSR. 2. AN Belorusskoy SSR
(for Stepanov). (Masers)

ZHBANKOV, Rostislav Georgiyevich; STEPANOV, B.I., akademik, red.

[Infrared spectra of cellulose and its derivatives] In-
frakrasnye spektry tselliulozy i ee proizvodnykh. Minsk,
Nauka i tekhnika, 1964. 338 p. (MIRA 18:2)

1. Akademiya nauk Belorusskoy SSR (for Stepanov).

STEPANOV, B.I. [Stsiapanau, B.I.]; PRISHIVALKO, A.P. [Pryshyvalka, A.P.]

Method for calculating the luminescence in an open resonator
with nonparallel end parts. Vestsi AN BCSR. Ser. fiz.-tekh.
nav. no.3:24-34 '64. (MIRA 18:2)

AUTHOR: Stepanov, B. I.; Rubanov, A. S.

TITLE: Considering the effect of noise on the optical properties of a laser

CITED SOURCE: Zh. prikl. spektroskopii, v. 1, no. 1, 1964, 35-40

TOPIC TAGS: solid laser, laser optical property, noise factor

TRANSLATION: The authors consider the effect of noise radiation density on the threshold, generating power, and efficiency of the working substance of a solid laser. Noises occur due to luminescence and scattering of the primary flux, also as a result of all other amplified noises. Formulas are evolved for evaluating effects of noises in lasers operating on triple and quadruple level schemes.

Bibl. with 2 titles.

SUB CODE: EC, OP

ENCL: 00

Card 1/1

SOURCE: Ref. zh. Fizika, Abs. 6Zh58

AUTHORS: Vanyukov, M. P.; Isayenko, V. I.; Serebryakov, V. A.; Stepanov, B. I.

TITLE: Noise density in a neodymium glass laser

CITED SOURCE: Zh. prikl. spektroskopii, V. 1, no. 2, 1964, 141-147

TOPIC TAGS: laser, neodymium glass laser, noise density, laser power, laser operation

TRANSLATION: The authors investigated the dependence of the laser generation power on the mirror reflection coefficient and on the pump power. An analysis of the results has made it possible to estimate the influence of the noise on the generation power. It is shown that the noise density u_n is connected with the pump radiation density in the following fashion

$$u_n = a + b(u_{\text{pump}} - u_{\text{thr}})$$

where a and b are constants that depend on the dimensions of the rod and of the side surfaces; u_{thr} is the threshold pump density. A cylindrical rod of neodymium glass with length $l = 14$ cm and diameter $d = 1.5$ cm was investigated. One of the

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L-59191-65

ACCESSION NR: AR5017554

mirrors was dense, with a transmission coefficient $T = 5\%$. The output mirror was interchangeable and could have transmission coefficients 9, 19, 40, 48, 60, and 79%. The authors investigated the dependence of different laser parameters on the value of the useful losses connected with the different transmission coefficients of the output mirror. Such parameters were: the lasing time, the time interval between the turning on of the pump lamp and the start of lasing, the lasing flux density, the noise density, etc. It is noted that the magnitude of the noise in the working medium of quantum generators is quite large, and no accurate description of the generation processes can be obtained without account of the noise.

A. Grasyuk.

SUB CODE: EC

ENCL: 00

Card 2/2

ACCESSION NR: APh020380

8/0250/64/008/002/0090/0093

AUTHORS: Stepanov, B. I.; Rubanov, V. S.

TITLE: A method for determining absolute concentration of excited catalyst particles in a scintillation mixture

SOURCE: AN BSSR. Doklady*, v. 8, no. 2, 1964, 90-93

TOPIC TAGS: scintillation mixture, transmission probability, catalyst ion, excited state, solute absorption, optical excitation

ABSTRACT: For two-component liquid scintillation mixtures excited by a light source in the solute absorption band, the kinetic equation becomes

$$Bun_1 - \left(\frac{1}{\tau} + \alpha n_1' \right) n_2 = 0,$$

$$\alpha n_2 n_1' - \frac{1}{\tau'} n_2' = 0,$$

Card 1/3

ACCESSION NR: AP4020380

where α - proportionality coefficient between energy transmission probability and concentration of unexcited catalyst ions, U - density of exciting radiation, n_1 , n_2 , n_1' , n_2' - number of excited and unexcited solvent particles and catalyst particles respectively, τ and τ' - lifetime of excited state in pure solvent and activator, respectively. Assuming small perturbations $n_1 \approx n$, $n_1' \approx n'$, the solution of the above equations leads to the luminescence intensity

$$I = A'n_1h\nu' = A'nBu_1h\nu' \frac{\alpha n}{1 + \alpha n'}$$

This expression permits the determination of the magnitude of $\alpha\tau$ of the mixture if $I(n')$ and $\tau'(n')$ are known. An exact solution of the kinetic equations is also given for particle conservation condition

$$n_1 + n_2 = n, \quad n_1' + n_2' = n'$$

Card 2/3

ACCESSION NR: APL020380

It is shown that these results can be applied to the case of optical excitations in scintillation mixtures. Orig. art. has: 18 formulas and 2 figures.

ASSOCIATION: Institut fiziki AN BSSR (Institute of Physics AN BSSR)

SUBMITTED: 09Dec63

DATE ACQ: 27Mar64

ENCL: 00

SUB CODE: GP

NO REF SOV: 001

OTHER: 002

Card 3/3

ACCESSION NR: AP4011504

S/0051/64/016/001/0167/0169

AUTHOR: Stepanov, B.I.; Samson, A.M.

TITLE: Rate of attainment of stable oscillation of lasers

SOURCE: Optika i spektroskopiya, v.16, no.1, 1964, 167-169

TOPIC TAGS: settling time, laser, laser oscillation, laser stability, laser modes, radiation density

ABSTRACT: The paper presents a brief mathematical analysis of the rate of attainment of stable operation of lasers. The initial equation characterizing the variation of radiation density with time for a given mode is taken from earlier work by the authors (E.P.Zege, A.M.Samson and B.I.Stepanov, DAN BSSR, 6, 288, 1962). The absorption coefficient is assumed to depend only on the frequency. Both useful loss (emission) and harmful losses are taken into account. The settling times for different modes and conditions of emission are evaluated; they are of the order of 10^{-4} sec. The stable density versus time function is, as a rule, characterized by narrow peaks ($\Delta t < 10^{-6}$ sec). Orig.art.has: 12 formulas.

Card 1/2

ACC.NR: AP4011504

ASSOCIATION: none

SUBMITTED: 20May63

DATE ACQ: 14Feb64

ENCL: 00

SUB CODE: FH

NR REF SOV: 005

OTHER: 000

2/2
Card

STEPANOV, B. I.; OGOLEVA, L. N.

Relation of isomers in azo coupling reactions. Part 1.
Coupling of diazo benzene with α -naphthol. Zhur. ob. Khim. 34
no.6:2074-2076 Jo '64. (MIRA 17:7)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni Mendeleysva.

ACCESSION NR: AP4017155

S/0053/64/082/002/0201/0220

AUTHORS: Stepanov, B. I.; Gribkovskiy, V. P.

TITLE: Use of the probability method for the calculation of optical characteristics of lasers

SOURCE: Uspekhi fizicheskikh nauk, v. 82, no. 2, 1964, 201-220

TOPIC TAGS: laser, quantum generator, optical quantum generator, probability method of calculation, spontaneous emission coefficient, absorption coefficient, transition probability, threshold pump radiation density, pump absorption power, generation power, luminescence power, metastable level splitting, three level laser, four level laser

ABSTRACT: It is shown that the probability method of calculation proposed by Einstein (Phys. Zs., v. 18, 121, 1917) can be used to calculate the optical properties of such distinctly nonlinear sys-

Card 1/4

51"
ACCESSION NR: AP4017155

tems as lasers, that the main properties of lasers can be explained on the basis of the probability method and the theory of cavity resonators, and that sufficient agreement between experiment and the calculations can be obtained in many of the most important cases. Expressions are derived for the populations of the level pairs of interest in terms of combinations of the Einstein spontaneous emission and absorption probabilities and the non-optical transition probabilities, and analogous formulas are obtained for the (negative or positive) power absorption of external radiation. The equation derived for the absorption coefficient (which can be positive or negative) is the same as obtained by other methods. Expressions are derived for the nonlinearity parameters in the case of two- and three-level lasers. The probability method is then applied to the calculation of the energy characteristics of the laser medium (threshold pump radiation density, pump absorption power, and generation power). An equation is derived for the generation power in terms of the properties of the cavity and of the quantities that

Card 2/4

ACCESSION NR: AP4017155

characterize the interaction between the medium and the external pump radiation. By way of example, more detailed calculations are made of the level populations, absorption power, luminescence power, and generation power as functions of the pump radiation density for three-level lasers. It is shown that the introduction of reflecting surfaces in the cavity leads not to an increase in the number of active molecules, as is frequently stated, but to an increase in absorption power which in turn gives rise to generation. A similar effect is produced by an increase in the pump power. The splitting of the metastable level and the conditions under which oscillation can be produced at any of the component frequencies are discussed in some detail. Four-level lasers are also discussed briefly. It is concluded that in spite of the very general assumptions on which the probability method is based, its results agree well with many of the experimental data, especially the linear dependence of the absorption and generation power on the pump radiation density and the increase in the threshold and cessation of generation with increase

Card 3/4

ACCESSION NR: AP4017155

in temperature. The method is expected to be widely used in the development of a complete laser theory. Orig. art. has: 3 figures and 7 formulas.

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 19Mar64

ENCL: 00

SUB CODE: PH

NO REF SOV: 017

OTHER: 011

Card

4/4

L 4494-66 EWA(k)/FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(M)-2/EWA(N) 201 107 100
SOURCE CODE: UR/0368/65/003/004/0325/0335

ACC NR: AP5026318

AUTHOR: ⁴⁴Stepanov, B. I.; ⁴⁴Chekalinskaya, Yu. I. ⁴⁴

ORG: none

TITLE: Fluorescence of two generating rods arranged in series

SOURCE: Zhurnal prikladnoy spektroskopii, v. 3, no. 4, 1965, 325-335

TOPIC TAGS: ⁴⁴multiple element laser, ⁴⁴composite laser, laser

ABSTRACT: The performance of a multiple-element laser is analytically investigated by the use of a model comprised of two rods connected at two of their reflecting end plates and thus forming a complex intermediate layer. It is shown that the losses of such a double system depend not only on the parameters of the resonator, but also on the initial amplification factor. If the length of the two rods is equal, and the pumping intensity and the reflection coefficients of the external faces are the same for both components, then the composite generator is similar to a single continuous rod. However, if the above enumerated parameters are not equal for the components of the multiple-element laser, then the presence of the intermediate layer will manifest itself by a drop of the generation threshold of the system. Orig. art. has: 26 formulas and 5 figures. [ZL]

SUB CODE: ELOP/ SUBM DATE: 17May65/ ORIG REF: 007/ OTH REF: 007/ ATD PRESS: 4/30

Card 1/1

UDC: 535.89

L 3931-66 EWA(k)/FBD/EWT(1)/EPF(c)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c)
WG/WW/GG

ACCESSION NR: AP5017692

UR/0250/65/009/006/0357/0359

AUTHORS: Khatkevich, A. G.; Bokut', B. V.; Stepanov, B. I.

TITLE: On the condition for phase matching in light-wave frequency conversion

SOURCE: AN BSSR. Doklady, v. 9, no. 6, 1965, 357-359

TOPIC TAGS: laser optics, ruby laser, refractive index, uniaxial crystal, frequency conversion

ABSTRACT: This is a continuation of an earlier paper (DAN BSSR v. 8, no. 11, 713, 1964), in which a general solution was given for the problem of light-wave frequency conversion by crystals and it was shown that in general, 14 polarization waves are produced when two waves are incident on a nonlinear crystal. The present paper considers the possibility of phase matching of all these waves, wherein the vector of the polarization-wave refraction coincides with the vector of the generated-wave refraction. The necessary condition for the phase matching is derived and is shown to be related with the ratio

Card 1/2

L 3931-66

ACCESSION NR: AP5017692

9

of the birefringence and the dispersion. The analysis shows that phase matching is possible for nine different polarization waves, and the wave with the higher frequency (polarization or pumping waves) should have a lower refractive index. The possibility of phase matching in a uniaxial crystal is further considered, and it is shown that in the case when the ordinary beam from a ruby laser operating at 6934 \AA is mixed with the extraordinary beam from a $\text{CaWO}_4:\text{Nd}^{3+}$ laser (10582 \AA) in a KDP crystal, phase matching takes place at an angle of 54.6° , whereas in the case when only the ordinary beams of these lasers are mixed the matching takes place at 42.6° . The authors thank B. A. Sotskiy and A. M. Goncharenko for a discussion of the results. This report was presented by B. I. Stepanov. Orig. art. has: 9 formulas.

ASSOCIATION: Institut fiziki AN BSSR (Physics Institute AN BSSR) 14,55

SUBMITTED: 30Apr64

ENCL: 00

SUB CODE: OP

NR REF SOV: 001

OTHER: 004

Card 2/2

L 61900-65 EWA(k)/FBD/ENG(r)/ENT(1)/ENP(e)/ENT(m)/EEG(k)-2/EMP(1)/T/EEG(b)-2/
 ENP(k)/EWA(m)-2/ENA(h) Pm-h/Pn-h/Po-h/Pf-h/Peb/Pi-h/Fl-h SCTB/IJP(c) HQ/STH
 UR/0250/65/009/006/0367/0371
 ACCESSION NR: AP5017695

AUTHOR: Stepanov, B. I.; Rubinov, A. N.; Mikhnov, S. A.

TITLE: Determination of the parameters of ruby laser losses

SOURCE: AN BSSR. Doklady, v. 9, no. 6, 1965, 367-371

TOPIC TAGS: laser, ruby laser, level population, laser loss, noise loss

ABSTRACT: The authors determined experimentally the main parameters of a ruby laser, characterizing the loss of generated radiation. The investigation is based on the theoretical premises developed in earlier papers (ZhPS v. 1, no. 1, 35, 1964; DAN BSSR v. 6, 147, 1962). Some results of earlier measurements (ZhPS v. 1, 3, 210, 1964) were also employed. Pink ruby and a resonator with plane removable mirrors were used. The behavior of the population of the metastable level of the ruby was investigated by oscillographic measurements of the time variation of $\log(T/T^0) = c(n_2/n)$ (T - transmission, T^0 - transmission without pumping, c - coefficient, n_2/n - relative population of metastable level). The tests showed that the population saturates not at the start of lasing, but somewhat later, and that the pump power affects only the time interval between the start of lasing and the establishment of constant population. This behavior is attributed to the optical inhomogeneity of the ruby. Another characteristic studied was the ratio of the

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ACCESSION NR: AP5017695

noise radiation flux per unit surface to the noise per unit volume, which is found to range from 0.467 to 0.518, depending on the power loss coefficient. Orig. art. has: 2 figures, 7 formulas, and 1 table. [02]

ASSOCIATION: Institut fiziki AN BSSR (Institute of Physics, AN BSSR) 44

SUBMITTED: 27 Nov 64

ENCL: 00

SUB CODE: EC

NO REF SOV: 006

OTHER: 004

ATD PRESS: 4060

dm
Card 2/2

ACCESSION NR: AP5019323

AUTHOR: Stepanov, B. I.; Prishivalko, A. P. 44

TITLE: The output power of gas lasers with plane mirrors as a function of mirror misalignment angle 25,44

SOURCE: AN BSSR. Doklady, v. 9, no. 7, 1965, 432-434

TOPIC TAGS: gas laser, laser, laser output, laser optics, laser power

ABSTRACT: A solution is presented to the problem of the field distribution and diffraction losses in resonators with inclined and bent mirrors in the geometrical optics approximation, using a previously described method (Izv. AN BSSR, ser. fiz.-tekhn. nauk, no. 3, 1964, p. 24). This approximation is permissible since the investigation is concerned only with the integral radiated power for which experiments have shown (Ye. F. Ishchenko, M. V. Ladygin, A. N. Sviridov, ZhPS, 1, 1964, p. 31) that geometrical optics provides satisfactory results. The solution is given for resonators with nonreflecting lateral surfaces, inasmuch as it has been demonstrated that properties of gas lasers are almost identical to properties of such types of resonators. A comparison of the magnitude of diffraction losses calculated earlier (A. Fox, T. Lee, Proc. IIER, 51, 116, 1963) and losses through the lateral surfaces

L 61002-65

ACCESSION NR: AP5019323

of the resonator shows that the latter has a greater effect on the radiated power, which fact provides additional evidence in favor of the applicability of geometrical optics. Results are summarized in Figs. 1 and 2 of the Enclosure, the latter showing that, since there is only a minor disparity between the theoretical and the experimental data, the results may be considered satisfactory. The method used is therefore thought to be applicable for calculations, provided corrections are made to account for diffraction losses. "The authors thank Zh. M. Korol' for help with the computations." Orig. art. has: 3 formulas and 2 figures. [08]

ASSOCIATION: Institut fiziki AN BSSR (Physics Institute, AN BSSR) 44

SUBMITTED: 01Dec64

ENCL: 02

SUB CODE: SS

NO REF SOV: 004

OTHER: 002

ATD PRESS: 4062

Card 2/4

L 61008-65

ACCESSION NR: AP5019323

ENCLOSURE: 01

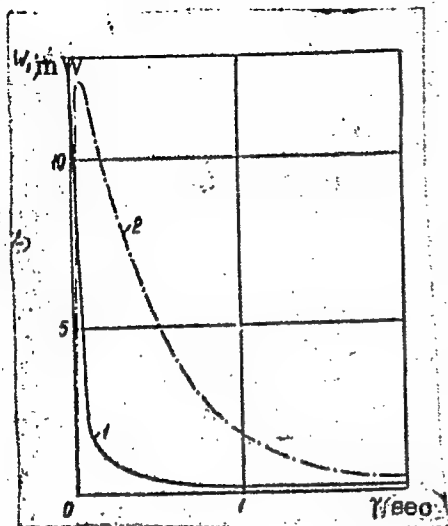


Fig. 1. Radiated power crossing the base (1) and the lateral surface (2) of the resonator as a function of the misalignment angle of the mirrors

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L-61 C-65

ACCESSION NR: AP5019323

ENCLOSURE: 02

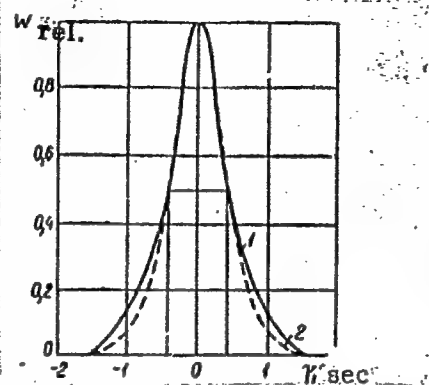


Fig. 2. Comparison of theoretical and experimental data.

1 - Calculated curve for $h = 4.3 \cdot 10^5$
 (h - distribution curve parameter);
 2 - experimental curve by D. Kilpatrick et al. (Proc. IRI, 50, 1588, 1962).

Card 4/4

L 9559-66 EWT(1)/T IJP(c) WW/GG

ACC NR: AP5027350

SOURCE CODE: UR/0250/65/009/010/0651/0653

AUTHOR: ^{44, 55}Stepanov, B. I.; ^{44, 55}Lashitskaya, R. K.

ORG: ^{44, 55}Institute of Physics, AN BSSR (Institut fiziki AN BSSR)

TITLE: The time-dependence of the absorption coefficient under the effect of intense short-term fluxes

SOURCE: AN BSSR. Doklady, v. 9, no. 10, 1965, 651-653

TOPIC TAGS: ^{21, 44, 55}light absorption, absorption band, absorption coefficient, optic filter, optic property ^{21, 44, 55}

ABSTRACT: Recently, wide use has been made of optical switches made of a substance which becomes transparent under the effect of intense radiation fluxes of short duration. The search for bleachable absorbers is being conducted empirically. The present article examines the properties of a volume of the simplest two level system. It is assumed in the calculations that the broadening of the absorption band is uniform and, consequently, the incident fluxes cause no variation in the shape of the band. It is also assumed that the spectral width of the irradiating flux is considerably smaller than the width of the absorption band. An analysis of the calculations shows that the bleaching of the substance may be achieved only with certain fluxes. Flux magnitudes at which bleaching is achieved during the period of the order of 10^{-8} sec are relatively small and are easily produced under modern experimental conditions.

Card 1/2

L 9559-66

ACC NR: AP5027350

0

It is found that the transparency increases with decreasing width of the absorption band. Orig. art. has: 2 figures and 9 formulas. [08]

SUB:CODE: OP, NP/ SUBM DATE: 08Jul65/ ORIG REF: 001/ OTH REF: 003/ ATD PRESS:

4157

Back
Card 2/2

L 1379-66 EWA(k)/FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c)

ACCESSION NR: AP5020795

WG

UR/0048/65/029/008/1335/1339

AUTHOR: Stepanov, B. I.⁴⁴; Gribkovskiy, V. P.^{44, 55}

TITLE: Determination of the possibility of obtaining inversion population levels on the basis of the luminescent spectra characteristics of the material

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 8, 1965, 1335-1339

TOPIC TAGS: luminescent spectra, luminescence, population inversion, laser

ABSTRACT: A method is proposed for selecting materials with characteristics favorable for population inversion. On the basis of their extensive studies of the subject (B. I. Stepanov and V. P. Gribkovskiy, Vvedeniye v teoriyu lyumines-tsentsii, Izd. AN BSSR, Minsk, 1963; B. I. Stepanov and V. P. Gribkovskiy, Dokl. AN BSSR, 7, 17, 1963; B. I. Stepanov and V. P. Gribkovskiy, Dokl. AN BSSR, 7, 305, 1963; B. I. Stepanov and V. P. Bribkovskiy, Uspekhi fiz. nauk, 82, 201, 1964) the authors demonstrate that this can be achieved by experimentally determining a series of optical parameters, most of which can be obtained from the luminescent spectra. The following tests for determination of parameters are given: 1) measurement of the absorption spectra in the interval of frequencies in which the pumping effect is expected, and computation of Einstein's coefficients; 2) measurement of absorption in the R-line; 3) investigation of the luminescent spectrum and determination of the frequencies at which the narrow lines of stimulated

Card 1/2

L 1379-66

ACCESSION NR: AP5020795

emission coincide with luminescence lines. Also, measurement of the width of the luminescence lines; 4) study of the rules of luminescence extinguishment; 5) evaluation of the absolute value of the quantum yield of luminescence lines; and 6) plotting of the absorption spectrum of strongly excited matter. The suitability of the sample for laser action can be established from the data obtained. Orig. art. has: 20 formulas. [ZL]

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: EC

NO REF SOV: 005

OTHER: 000

ATD PRESS: 4098

Card ^{MC} 2/2

ROKANOV, A.I.; KOROLIV, B.A.; STEPANOV, B.I.

Basicity of phosphines and the electronic properties of some
organophosphorus groups. Zhur. ob. khim. 35 no.10:1879-
1880 O '65. (MIRA 18:10)

1. Moskovskiy khimiko-tekhnologicheskii institut imeni D.I.
Mendeleeva.

Card 1/2

L 64007-65

ACCESSION NR: AP5017453

tal in the form of a cylinder 48 mm long and 8 mm in diameter. Plots of the flux densities as functions of the loss factor are presented. Conditions under which the noise density becomes appreciable, and even exceeds the useful radiation density, are indicated. Orig. art. has: 2 figures and 12 formulas. [02]

ASSOCIATION: Institut fiziki Akademii nauk BSSR (Physics Institute, Academy of Sciences, BSSR)

SUBMITTED: 12Feb65

ENCL: 00

SUB CODE: EC

NO. REF SOV: 007

OTHER: 004

ATD PRESS: 4057

Card 2/2

L 33341-66 EEC(k)-2/EWP(k)/EWT(1)/EWT(m)/FBD/T/EWP(a) TJP(c) WH/WG
ACC NR: AP6006961 SOURCE CODE: UR/0368/66/004/002/0122/0128

AUTHOR: Stepanov, B. I.; Mikhnov, S. A.; Rubinov, A. N.

57
B

ORG: None

TITLE: Experimental comparison of different methods of determining the loss parameter in quantum generators on neodymium glass

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 2, 1966, 122-128

TOPIC TAGS: laser theory, neodymium laser, quantum generator

ABSTRACT: Quantum generators have a very low efficiency coefficient, due mostly to the losses of the generated emission in the resonator owing to diffraction, inactive absorption, and dispersion. In theory, all of these losses are described by a single parameter which is one of the most important characteristics of the generator. Two methods for determining this parameter have been described elsewhere. The present article makes a comparison and an experimental verification of different methods of determining the loss parameters in neodymium lasers, approximately described by means of a four-level scheme. Orig. art. has: 4 figures and 7 formulas.

SUB CODE: 20 / SUBM DATE: 11Aug65 / ORIG REF: 008

Card 1/1

UDC 535.89

I 23479-66 EEC(k)-2/EWA(h)/EWP(k)/EWT(1)/FBD/T IJP(c) WG

ACC NR: AP6010445

SOURCE CODE: UR/0368/66/004/003/0222/0229

AUTHOR: Stepanov, B. I.; Rubinov, A. N.

ORG: none

TITLE: The effect of shifting of the Stokes component on the operating frequency of a laser 25/94

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 3, 1966, 222-229

TOPIC TAGS: laser, stimulated emission, laser theory, laser cavity, rate equation

ABSTRACT: The dependence of the oscillation frequency on the shifting of the Stokes component of absorption and emission spectra of a three-level (electronic-vibrational) system was investigated using appropriate rate equations. It is shown that the oscillation frequency of a laser with an equilibrium distribution of particles depends on the radiation losses in the laser and can be varied by changing the Q of the cavity. An expression is derived for the temperature dependence of the oscillation frequency of such a laser. Orig. art. has: 22 formulas and 4 figures. [CS]

SUB CODE: 20/ SUBM DATE: 21Aug65/ ORIG REF: 006/

Card 1/1 20

UDC: 535.89

L 28376-66 EEC(k)-2/EWA(h)/EWP(k)/EWT(1)/EWT(m)/FBD/T/EWP(e) IJP(c) WH/WG

ACC NR: AP6013104

SOURCE CODE: UR/0368/66/004/004/0348/0350

AUTHOR: Stepanov, B. I.; Rubanov, A. S.; Chaley, A. V.

73
8

ORG: none

TITLE: Thermal regime of a glass laser 25

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 4, 1966, 348-350

TOPIC TAGS: neodymium glass, solid state laser, heat conduction, temperature distribution, laser r and d

ABSTRACT: The authors determine the temperature field in a neodymium-glass laser by solving the equations of heat conduction in a cylindrical rod under conditions of repeated generation pulse. The boundary conditions are introduced by determining the Biot number. Separate equations are written for the heating and the cooling cycle, first for stationary conditions and an infinitely long rod, and then for periodic application of heat, assuming the heating (lasing) time to be much shorter than the cooling time. Tables are presented for several rod diameters and several cooling times. Orig. art. has: 14 formulas and 2 tables. [02]

SUB CODE: 20/ SUBM DATE: 29Jun65/ ORIG REF: 001/ ATD PRESS: 4262

Card 1/1

UDC: 621.375.9

L 27729-66 FBT/EWT(1)/EWT(m)/EEC(k)-2/T/EWP(k)/EWA(h) IJP(c) W3

ACC NR: AP6015589

SOURCE CODE: UR/0368/66/004/005/0389/0394

AUTHOR: Stepanov, B. I.; Rubanov, A. S.; Kabashnikov, V. P.; Chaley, A. V.

ORG: none

TITLE: Temperature conditions of a ruby laser

SOURCE: Zhurnal prikladnoy spektroskopii, v. 4, no. 5, 1966, 389-394

TOPIC TAGS: ruby laser, temperature, thermal analysis

ABSTRACT: Formulas are derived for the temperature field of a cylindrical ruby laser cooled by air, water, liquid nitrogen and liquid hydrogen assuming uniform heat release with respect to volume. Both monopulse conditions and free emission with a given prf are considered. The results of the formulas are tabulated and compared with the temperature conditions of a continuously operated ruby rod of various diameters. It is found that formulas derived by solving the thermal conductivity equation with boundary conditions of the first kind may be used for calculating the thermal conditions of a ruby laser at nitrogen temperatures when the ruby rod has a radius of 0.7 cm or greater. This type of calculation gives an error of approximately 25%. It is shown that steady-state conditions are reached for all practical purposes in about 0.03 sec for a cylinder with a radius of 0.8 cm. Orig. art. has: 3 tables, 18 formulas. [14]

SUB CODE: 20/

SUBM DATE: 29Jun65/

ORIG REF: 003/ ATD PRESS: 5002

Card 1/1

BLG

UDC: 621.375.9

1 09/18-67 REF(m)/REF(c) MI
ACC NR: A76027733

SOURCE CODE: UR/0020/66/169/004/0819/0822

AUTHOR: Stepanov, B. I. (Academician AN BSSR); Rubanov, A. S. 114

ORG: Institute of Physics, Academy of Sciences BSSR (Institut fiziki Akademii nauk BSSR)

TITLE: Energy balance of radiation noise in lasers

SOURCE: AN SSSR. Doklady, v. 169, no. 4, 1966, 819-822

TOPIC TAGS: laser radiation, ruby, neodymium glass, radiation spectrum, power loss, luminescence, light scattering

ABSTRACT: This is a continuation of earlier work (Zhurn. prikl. spektroskopii v. 1, 35, 1964; DAN v. 162, 1039, 1965) dealing with laser power loss due to noise. In the present article a connection is established, on the basis of energy balance, between the noise radiation density and the resonator characteristics, and a general scheme is proposed for the calculation of the energy characteristics of solid-state laser with allowance for the effect of radiation noise. Separate energy-balance equations are written for each noise source (scattering of the main flux, luminescence) and analytic expressions are obtained for the integral noise density and for the power of the generated radiation with allowance for the noise. The relations show that the main effect of noise is to lower the laser threshold. Concrete formulas and some numerical estimates are given for three- and four-level lasers. In the case of neodymium-glass and ruby rods, the average noise-loss coefficients are estimated at

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UDC: 621.375.9

L 09418-67

ACC NR: AP6027733

0.09 and 0.51 cm^{-1} , and the influence of the noise is appreciable, especially in the case of the neodymium glass. It is therefore concluded that the noise-loss coefficient is an important parameter of the resonator. Orig. art. has: 17 formulas.

SUB CODE: 20/ SUBM DATE: 04Mar66/ ORIG REF: 003

Cord 2/2

ACC NR: AP6036811

SOURCE CODE: UR/0368/66/005/005/0595/0603

AUTHOR: Stepanov, B. I.; Lashitskaya, R. K.

ORG: none

TITLE: The properties of passive Q-switches

SOURCE: Zhurnal prikladnoy spektroskopii, v. 5, no. 5, 1966, 595-603

TOPIC TAGS: laser, laser optic material, Q-switching, passive switching

ABSTRACT: A theoretical investigation was made of the properties of bleachable filters placed outside the resonant cavity. The dependencies of filter bleaching on the radiation intensity, initial transmission, time, and transition probabilities between the energy levels were determined. The transmission of light through the passive Q-switch results in energy losses through luminescence, thermoemission, and the accumulation of particles in excited states. The energy absorbed in a shutter with a transverse cross section s for a time Δt is $W_{abs} = \nu_0 s \Delta t (1 - T)$, where $\nu_0 s \Delta t$ is the energy incident on the shutter and $T = u/u_0$. The portion of incident energy lost inside the shutter is

$$r = \frac{W_{abs}}{\nu_0 s \Delta t} = \frac{1}{u u_0} \ln \frac{T}{T_0}$$

UDC: 535.89

Card 1/2

ACC NR: AP6036811

where u is the radiation density. With an increase of u_0 , T approaches unity, and the shutter is completely bleached. The energy loss, however, does not reach zero; the absorption intensity approaches a constant limit and only a portion of the energy losses Γ gradually decreases. At large u_0 , Γ_{lim} is inversely proportional to u_0 . The higher the nonlinearity of the system, the smaller the Γ . For a two-level system, the shorter the duration of the excited state, the larger the Γ_{lim}^{abs} and Γ_{lim} . Orig. art. has: 20 formulas and 3 figures.

SUB CODE: 20/ SUBM DATE: 08Apr66/ ORIG REF: 017/ OTH REF: 004/ ATD PRESS: 5107

Card 2/2

L 08867-67	EWP(o)/EWT(m)	WH	SOURCE CODE: UR/0250/66/010/007/0452/0455
ACC NR: AP6026964			
AUTHOR: Stepanov, B. I.; Rubanov, A. S.			50 B
ORG: Institute of Physics, AN BSSR (Institut fiziki AN BSSR)			
TITLE: Energy balance in pumping radiation			
SOURCE: AN BSSR. Doklady, v. 10, no. 7, 1966, 452-455			
TOPIC TAGS: laser pumping, ruby laser, resonator, neodymium glass			
<p>ABSTRACT: The authors consider a <u>ruby</u> rod laser and establish the relation between the pumping power of the lamp and the pumping energy density inside the rod. The results are used to compare the mathematical equations with the experimental data. Relations are obtained for the quantity of pumping light falling on the rod, the power absorbed in the rod, noise, and the losses due to reflection and transmission. In addition to dependence on the properties of the lamp, reflector, and the active substance, noise also depends on the properties of the resonator. When the noise rises, resonator efficiency drops and generation power declines toward zero. Equations, similar to those obtained for ruby, are derived for four-level <u>neodymium glass lasers</u>. Orig. art. has: 16 formulas.</p>			
SUB CODE: 20/	SUBM DATE: 31Mar66/	ORIG REF: 011	
Card 1/1 egk			

L 09355-67 REC(k)-2/EWP(k)/EWT(1) IJP(c) WG
 ACC NR: AP6023205 SOURCE CODE: UR/0020/66/168/006/1294/1297
 49
 47

AUTHOR: Stepanov, B. I. (Academician AN BSSR)

ORG: Institute of Physics, Academy of Sciences, BSSR (Institut fiziki Akademii nauk BSSR)

TITLE: Change of generation channel in a four-level quantum generator 75

SOURCE: AN SSSR. Doklady, v. 168, no. 6, 1966, 1294-1297

TOPIC TAGS: quantum generator, laser theory, temperature dependence

ABSTRACT: This is a continuation of earlier work (UFN v. 72, 201, 1964; DAN v. 150, 507, 1963), devoted to the shift of generation from one channel to another when the operating conditions of a quantum generator are altered. The present article deals with the conditions for the transformation of the generation channel and for simultaneous generation in several channels, using a four-level generator with unsplit levels as an example. It is assumed for simplicity that the probabilities of the non-optical transitions are equal to zero, and that the accumulation of particles at the fourth level is very small. The level populations are first determined for the case when generation takes place in the channel $3 \rightarrow 2$. It is shown that when the temperature is varied, the population of the third level begins to exceed that of the first, and population inversion of levels 3 and 1 is attained. The conditions under which this inversion is attained, and the additional conditions necessary for generation to occur at the corresponding frequency, are determined. The computations consist essentially

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L 09355-67

ACC NR: AP6023205

of determining the different ratios of the loss coefficients in the various channels, and determining the limiting gain under which population inversion and generation occur at transitions other than $3 \rightarrow 2$. It is shown that whereas simultaneous generation in two channels is readily realizable, simultaneous generation in three channels is practically impossible and occurs only under accidental combinations of the loss coefficients. Another necessary condition for this to occur is that the population of the fourth level, which was assumed negligible in the analysis, be appreciable. The author thanks A. M. Samson for valuable advice. Orig. art. has: 23 formulas and 1 table.

SUB CODE: 20/09/ SUBM DATE: 04Mar66/ ORIG REF: 003/ OTH REF: 001

Card 2/2

L 10477-67

ACC NR: AP6024333

SOURCE CODE: UR/0428/66/000/001/0082/0090

AUTHORS: Stepanov, B. I.; Chekalinskaya, Yu. I.

ORG: none

TITLE: The generation of a composite system from several parallel distributed rods

SOURCE: AN BSSR. Vestsi. Seryya fizika-matematichnykh navuk, no. 1, 1966, 82-90

TOPIC TAGS: nuclear reactor power, nuclear power, nuclear power plant, power plant

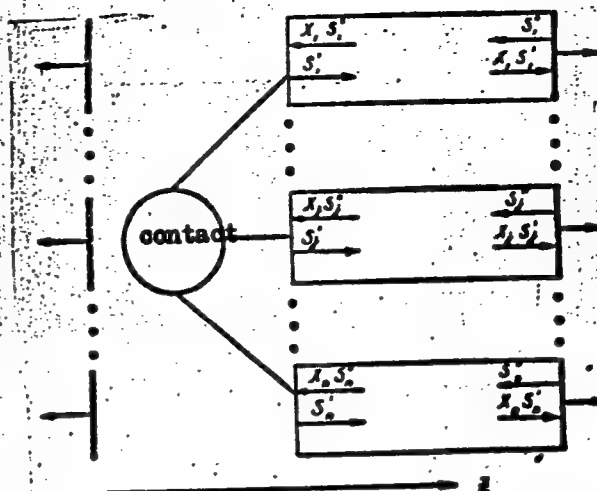
ABSTRACT: This article deals with the study of the radiance of several substances situated in parallel. Calculations are performed on the basis of energetics considerations in a nonlinear approximation. In parallel linkage the presence of contact permits a coherence of radiation because of mutual penetration of streams. The authors base their mathematical approach first on the general case of an arbitrary link and varying length of bars, and then on the consideration of two special cases where all rods are alike. The composite generator is schematically shown in Fig. 1. It consists of n active rods mutually joined by some link. Variables are defined as: v_j - the reflection coefficient on unjoined faces; R_j - the fraction of radiation returning to the j -th bar after reflection in the system, including reflection from the joined face; Δ_{ij} is the fraction of radiation emanating from the i -th rod to the j -th as the result of the linkage; S_j is the current at the left boundary of the j -th

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ACC NR. AP6024333

Fig. 1. Diagram of a composite generator



active layer, directed along the z -axis; S_j is the current at the right boundary, directed inward. X_j , the current amplification coefficient in the j th active layer, is given by

$$X_j = e^{\int_0^L (b_j(u) - r_j(u)) du}$$

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ACC NR: AP6024333

where l_j is the length of the j^{th} active layer, and $k_j(z)$ and $\rho_j(z)$ are respectively the amplification coefficient and the loss coefficient of the active substance. A system of n linear homogeneous equations in S_j' and S_j'' are given in matrix form. The authors present a method for finding the complete system current in terms of an effective loss coefficient. From this analysis a means for determining optimum system configuration is described. Orig. art. has: 20 equations and 4 figures.

SUB CODE: 18/ SUBM DATE: 09Dec65/ ORIG REF: 004

Card 3/3 *plw*

ACC NR: AP6024337

SOURCE CODE: UR/0428/66/000/001/0131/0133

AUTHOR: Stepanov, B. I.; Gribkovskiy, V. P.; Rutkovskiy, F. K.

ORG: none

TITLE: The effect of the Q factor of a resonator on the power of the radiation generated

SOURCE: AN BSSR. Vestsi. Seryya fizika-matematychnykh navuk, no. 1, 1966, 131-133

TOPIC TAGS: resonator Q factor, resonator, generator, stimulated emission, excited particle

ABSTRACT: The dependence of the power generated by a resonator upon the reflection coefficient of the mirrors r is examined. The effect of r upon the pumping efficiency is taken into account. The radiation flux through an element of the end surface ds is determined by the expression

$$dS_{\text{gen}} = W_{\text{gen}} \frac{\ln(1/\sqrt{rr'}) ds}{\rho + l^{-1} \ln(\sqrt{rr'})}$$

where W_{gen} is the power of the stimulated emission per unit volume of the working material; l the length of the rod; and r and r' the reflection coefficients of the ends; the denominator is equal to the loss factor. It is found that, when the rod is short, an increase in the reflection coefficient from 0 to 1 can lead to great change

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L 09976-67

ACC NR: AP6024337

in the absorption coefficient of the pumping radiation under generation conditions and, therefore, to a change in the pumping-radiation density in the specimen. The considerations are valid for three-level generators and those four-level generators in which there is appreciable depletion of ground-state particles. Orig. art. has: 3 formulas and 1 graph.

SUB CODE: 09/ SUBM DATE: 30Jul65/ ORIG REF: 004

20/

Card 2/2 ^{6/17}

ACC NR: AP7000154

SOURCE CODE: UR/0250/66/010/011/0844/0846

AUTHOR: Lashitskaya, R. K.; Stepanov, B. I. (Academician AN BSSR)

ORG: Institute of Physics AN BSSR (Institut fiziki AN BSSR)

TITLE: Properties of bleachable filters with pre-populated metastable levels

SOURCE: AN BSSR. Doklady, v. 10, no. 11, 1966, 844-846

TOPIC TAGS: optical filter, bleachable filter, Q switching, laser modulation, passive switching

ABSTRACT: A study was made of the bleaching process and the dependence of the absorption and transmission coefficients of a bleachable filter on densities u_{pump} and u , to generalize the results for any filter operating as a four-level system. Uranyl glass was used as the model of such a filter (see Fig. 1). The results indicate that when $u \rightarrow \infty$, $T \rightarrow 1$ and the total bleaching occurs under high radiation densities. The greater the pumping, the slower the saturation. If the experimental value of the function $T(u, u_{\text{pump}})$ and the absorption due to $1 \rightarrow 2$

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ACC NR: AP7000154

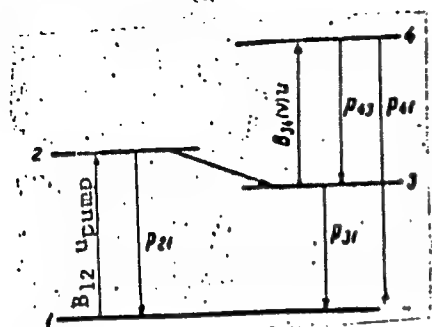


Fig. 1. Schematic of the levels

and $3 \rightarrow 4$ transition is known, the transition probabilities ρ_{31} and ρ_{43} can be calculated. Although the probability ρ_{41} was reflected in the calculations, the analysis shows that in certain cases, systems with larger ρ_{41} are more favorable. Orig. art. has: 2 figures and 6 formulas.

SUB CODE: 20/ SUBM DATE: 31May66/ ORIG REF: 002/ OTH REF: 002/ ATD PRESS: 5108

Card 2/2

I. 11103-67 EWT(m)/EWP(j) RM
ACC NR: AP7003659

SOURCE CODE: UR/0079/66/036/008/1447/1451

AUTHOR: Stepanov, B. I.; Migachev, G. I.
ORG: Moscow Chemicotechnological Institute Im. D. I. Mendeleev (Moskovskiy khimiko-
tehnologicheskii institut)
TITLE: Chemical properties of phosphonitrilepyridinium salts
SOURCE: Zhurnal obshchey khimii, v. 36, no. 8, 1966, 1447-1451
TOPIC TAGS: pyridine, organic nitrile compound, organic phosphorus

ABSTRACT: It is postulated that the nucleophilic substitution of chlorine in phosphonitrile chloride in the presence of pyridine proceeds through a stage of formation of phosphonitrilepyridinium salts. The role of pyridine, like other tertiary amines, in nucleophilic reactions of phosphonitrile halides, is reduced to intermediary nucleophilic catalysis, in which salts of the phosphonitrile halides and tertiary amines act as the intermediate. It was found that phosphonitrilepyridinium salts can act as pyridylating agents in the production of gamma-substituted pyridines. The reaction of phosphonitrilepyridinium salts with dialkylanilines was studied; 4-[p-dimethylaminophenyl]-pyridine, 4-[p-diethylaminophenyl]-pyridine, 4-[p-methylethylaminophenyl]-pyridine, and 4-[p-dibutylaminophenyl]pyridine were produced and characterized. Orig. art. has: 1 table. [JPRS: 38,970]

SUB CODE: 07 / SUBM DATE: 01Ju165 / ORIG REF: 004 / OTH REF: 009

Card 1/1 ^{jb}

UDC: 547.82 + 661.718.1
0926 0282

10

ca

Processes and Properties Index

Diazo compounds. IV. The influence of polyhydric alcohols and some saccharides on the diazotization of *m*-phenylenediamine. V. V. Kozlov and B. I. Stepanov. *J. Gen. Chem.* (U. S. S. R.) 10, 1810-23(1940); cf. preceding abstr.—The influence of addn. of glycerol, mannitol, (CH₂OH)₂, saccharose, glucose, maltose, lactose and raffinose on the diazotization of *m*-C₆H₄(NH₂)₂ (I) was investigated. The yield of bisdiaz. compd. formed was found to increase with the increasing nos. of HO groups in the mol. of the added substance. It also increased with the concn. of the added substance in soln. It was also found that the addition of glycerol increased the speed of the azo-coupling reaction. Six curves, 18 tables and 17 references are given. James J. Lichtin

ASTM-SLA METALLURGICAL LITERATURE CLASSIFICATION

STEPANOV, B. I., Engineer

Cand Chem Sci

Dissertation: "Influence of Medium on the Properties of Diazo-Compounds."

25 March 49

Moscow Order of Lenin Chemical Technological Inst imeni D. I. Mendeleyev.

SO Vecheryaya Moskva
Sum 71

USSR/Chemistry - Resonance

Aug 51

"Regarding Hydrogen Exchange Reactions of Toluene Derivatives," B. I. Stepanov, Moscow

"Zhur Fiz Khim" Vol XXV, No 8, pp 992, 993

PA 190T22

Continues polemic with A. I. Brodskiy et al, stating that he accepts with satisfaction Brodskiy's admissions to the effect (1) that the resonance theory is erroneous, (2) that his work does not refute P. P. Shorygin's views on the tautomerism of toluene derivatives by the ionization mechanism. Goes on to say that these views are not Shorygin's at all, but Brodskiy's own; that the 2d admission is important,

LC

190T22

USSR/Chemistry - Resonance (Contd)

Aug 51

because the general impression exists that Brodskiy disproved Shorygin's theory; that contrary to known facts, Brodskiy ascribes quasi-acidic properties to toluene.

STEPANOV, B. I.

LC

190T22

STEPANOV, B.I.

Istoriia velikogo zakona (History of
a great law (Mendeleev's)). Izd. 2-e, Moskva,
Molodala gvardiia, 1952. 328 p.

SO: Monthly List of Russian Accessions, Vol. 6, No. 1, April 1953

STEPANOV, B.I.

KOZLOV, V.V.; STEPANOV, B.I.

Influence of pyridine on the rate of coupling of *p*-nitrobenzenediazonium chloride and diethylaniline. Zhur. Fiz. Khim. 26, 592-7 '52. (MIRA 5:6)
(Ca 47 no.20:10494 '53)

1. D.I.Mendeleev Chem.-Technol. Inst., Moscow.

STEPANOV, B.I.

KOZLOV, V.V.; STEPANOV, B.I.

Rate of coupling of *p*-nitrobenzenediazonium chloride with diethylaniline
in the presence of quinoline. Zhur. Fiz. Khim. 26, 701-2 '52. (MLRA 5:8)
(CA 47 no.20:10494 '53)

1. Mendeleev Chem.-Technol. Inst., Moscow.